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| EXAMINER | |
|---|---|
| KENNEDY, TIMOTHY J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1791 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/536,897 | LARSSON, MORGAN | |
| | Examiner | Art Unit | |
| | TIMOTHY KENNEDY | 1791 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *13 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,2,4,6,7,9,13 and 14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6,7,9, 13, 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. By way of the amendment filed 4/13/2009; claims 1, 2, 4, 6, 7, and 9 are amended, claims 3, 5, 8, and 10-12 are cancelled, and claims 13 and 14 are new.

### *Claim Objections*

2. The objections to claims 4-6 and 9-12 are withdrawn due to the amendments to the claims.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1, 2, 4, 13, and 14 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. Claims 2, 4, 13, and 14 are rejected due to their dependency. See MPEP § 2172.01. A claim which fails to interrelate essential elements of the invention as defined by applicant(s) in the specification may be rejected under 35 U.S.C. 112, second paragraph, for failure to point out and distinctly claim the invention. See In re Venezia, 530 F.2d 956, 189 USPQ 149 (CCPA 1976); In re Collier, 397 F.2d 1003, 158 USPQ 266 (CCPA 1968)

5. In claim 1 there is no interrelationship between the energy balance calculation and the remainder of the process. There is no language in claim 1 that connects the steps of calculating, determining, and solving to a next step in the rapid prototyping process. The same is true regarding the thermal conductivity equation.

6. The Examiner suggests importing the limitation indicated in claim 2 into claim 1, since the processing in claim 2 is the resultant step of the calculating, determining, and solving. This is not an indication of allowable subject matter, but an indication of what could easily be done to overcome this rejection under the second paragraph of 35 U.S.C. 112. However this is not true for the thermal conductivity equation, Since no where else in the pending claims is a use disclosed for the thermal conductivity equation.

7. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. It is unclear as to how a temperature distribution can be stationary and in what direction that the temperature distribution is stationary. Does this mean that the distribution is linear with a slope, or linear with a slope of zero? Clarification is requested.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1, 2, 6, 7, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andersson et al (WO 01/81031; from previous Office Action).

Regarding claim 1:

12. A method for production of three-dimensional bodies by successive fusing together of selected areas of a powder bed, which parts correspond to successive cross sections of the three-dimensional body (page 16, lines 27-30)

13. Applying a powder laver to a work table (page 16, line 31)

14. Fusing said powder layer by supplying energy from a radiation gun according to an operating scheme determined for the powder layer to said selected area within the powder layer such that the powder in said selected area is fused into a cross section of said three-dimensional body (page 16, lines 32-33 – page 17, lines 1-3)

15. Further regarding claim 1:

16. Calculating an energy balance for said selected area

17. Said calculating including determining whether energy radiated into the selected area is sufficient to maintain a defined working temperature of the selected area

18. Solving a thermal conductivity equation for a given temperature distribution of the selected area.

19. Applicant discloses that the energy balance can be calculated using any or all of the following parameters: total area of the part area; total volume of the part area; total

length of the edge of the part area; ambient temperature of the powder layer; temperature of the top powder layer; temperature in a fused-together area within the selected area in the top layer; desired surface temperature of the fused- together selected area; temperature at the bottom of the three-dimensional body; temperature in the upper surface of the three-dimensional body; temperature of the three-dimensional body before energy is supplied to the selected area in the top layer, [which is referenced for understanding and not for incorporating unclaimed features.]

20. Andersson et al disclose the use of a camera for sensing the temperature distribution of a surface layer on the powder bed and to control the temperature distribution based on the observed temperature distribution (page 8, lines 27 through page 9, line 5), but does not directly disclose an energy balance equation for determining the needed working temperature nor solving a thermal conductivity equation.

21. However, it would have been obvious to one having ordinary skill in the art at the time the invention as made that the temperature distribution information from the camera is used in a calculation to determine how the temperature distribution needs altered based on the energy input from the radiation gun. Thus an energy balance equation is implied by the alteration of the temperature distribution form the temperature distribution data gained from the camera. Furthermore one having ordinary skill in the art would understand that thermal conductivity would play a factor in the alteration of the temperature distribution since thermal energy would be escaping from the active area,

thus the need for the camera to sense changes in the temperature distribution and thus also the need to alter the temperature distribution if need be.

22. Regarding claim 2:

23. Where said supplying energy from a radiation gun also includes heating the selected area to a defined working temperature if the calculated energy balance indicates there is insufficient energy to maintain the selected area at said defined working temperature

24. As mentioned previously the temperature distribution sensing camera of Andersson et al would inherently sense the temperature of the selected area, and thus when altering the temperature distribution would also maintain the selected area at the proper temperature based off the calculation as previously discussed.

25. Regarding claim 6, Andersson et al teaches:

26. A work table on which said three-dimensional product is built up (page 14, lines 5-6)

27. A powder dispenser that distributes a thin layer of powder on the work table, thereby forming a powder bed (page 14, lines 6-7)

28. A radiation gun that fuses the powder together by delivering energy thereto (page 14, lines 6-7)

29. A beam guide that guides the beam emitted by the radiation gun over said powder bed such that the beam forms a cross section of said three- dimensional product by fusing together parts of said powder bed (page 14, liens 8-10)

30. A control computer which stores information about successive cross sections of the three-dimensional product, which cross sections build up the three-dimensional product, controls the beam guide according to an operating scheme (page 14, liens 10-18)

31. Further regarding claim 6:

32. Calculates an energy balance for at least one part area within each powder layer, by determining whether energy radiated into the part area is sufficient to maintain a defined working temperature of the part area and solving a thermal conductivity equation for a given temperature distribution of the part area.

33. Applicant discloses that the energy balance can be calculated using any or all of the following parameters: total area of the part area; total volume of the part area; total length of the edge of the part area; ambient temperature of the powder layer; temperature of the top powder layer; temperature in a fused-together area within the selected area in the top layer; desired surface temperature of the fused- together selected area; temperature at the bottom of the three-dimensional body; temperature in the upper surface of the three-dimensional body; temperature of the three-dimensional body before energy is supplied to the selected area in the top layer, [which is referenced for understanding and not for incorporating unclaimed features.]

34. Andersson et al disclose the use of a camera for sensing the temperature distribution of a surface layer on the powder bed and to control the temperature distribution based on the observed temperature distribution (page 8, lines 27 through page 9, line 5), but does not directly disclose an energy balance equation for

determining the needed working temperature nor solving a thermal conductivity equation.

35. However, it would have been obvious to one having ordinary skill in the art at the time the invention as made that the temperature distribution information from the camera is used in a calculation to determine how the temperature distribution needs altered based on the energy input from the radiation gun. Thus an energy balance equation is implied by the alteration of the temperature distribution form the temperature distribution data gained from the camera. Furthermore one having ordinary skill in the art would understand that thermal conductivity would play a factor in the alteration of the temperature distribution since thermal energy would be escaping from the active area, thus the need for the camera to sense changes in the temperature distribution and thus also the need to alter the temperature distribution if need be.

36. Regarding claim 7:

37. Where the control computer controls the beam guide according to the operating scheme, such that, in addition to said energy for fusing together powder layers (page 14, liens 10-18), the radiation gun delivers energy for heating the powder layer to a defined working temperature if the calculated energy balance indicates there is insufficient energy to maintain the selected area at said defined working temperature (See remarks regarding claim 2)

38. Regarding claim 13:

39. Said calculating energy balance includes assuming that the entire selected area has the same temperature

40. Andersson et al do not explicitly state that an assumption is made that the entire selected are has the same temperature. However this would have been an obvious assumption to one having ordinary skill in the art at the time the invention was made since in order for there to be complete fusion of the powder across the entire selected area the entire area would have to have the same temperature at some point during the process. Add in the fact that the temperature distribution process as discussed with regards to claims 1 and 6 would make this possible since for the entire selected area would have the same temperature thus the temperature distribution process could maintain the selected area at the same temperature.

41. Regarding claim 14:

42. Said calculating an energy balance includes assuming that the temperature distribution during fusion is stationary

43. Andersson et al do not explicitly state that an assumption is made regarding the temperature distribution being stationary. However this would have been an obvious assumption to one having ordinary skill in the art at the time the invention was made since a skilled artisan would not want the temperature distribution around the selected area to change during the fusing process since this would alter the final three-dimensional product. Add in the fact that the temperature distribution process as discussed with regards to claims 1 and 6 would make this possible since the temperature distribution can be altered based on the output of the radiation source and the data gained from the camera, as previously discussed.

44. Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andersson et al, in view of Beaman et al (U.S. Patent 5,352,405). Regarding claim 4:

45. As previously discussed Andersson et al teach the energy balance calculation for maintaining the selected area at the proper temperature, but does not teach:

46. Dividing the selected area into a set of separate areas

47. Calculating an energy for each of said separate areas

48. Determining whether there is sufficient energy to maintain the selected area at said defined working temperature by summing the energies of said separate areas

49. In the same field of endeavor Beaman et al teach dividing the selected area into separate areas (Figure 7). Furthermore Beaman et al teach the laser power can altered according to the shape of the smaller separate areas, which in turn produces less thermal vibrations and improves the structural uniformity of the part. (column 11, lines 45-58).

50. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the calculations of Andersson et al with the smaller separate areas of Beaman et al, since doing so improves both the thermal variations during production, and the final part. Thus making the needed calculations involve the summation of the total number of separate areas.

51. Regarding claim 9:

52. See remarks regarding claim 4.

### *Double Patenting*

53. The Double Patenting rejections from the previous Office Action are withdrawn due to the amendments to the claims, and the improper nature of the previous Double Patenting rejection.

### *Response to Arguments*

54. Applicant's arguments with respect to claims 1 and 6 filed 4/13/2009 have been considered but are moot in view of the new ground(s) of rejection.

55. Applicants arguments regarding claims 1 and 6 center around the difference between the instant invention's claim of "calculating" versus the "sensing" of Andersson et al.

56. The Examiner would like to point out that the previous use of the energy equation $H = Cp*m*\Delta T$ was indeed improper, as pointed out by the Applicant, since the H equation is used for closed systems; compared to the open system of the instant invention.

57. However, based on further evidence from Andersson et al, and the amendments to the claims the Examiner does not find the Applicant's argument persuasive. This is due to the fact that the "sensing" of Andersson et al inherently involves a calculation. Andersson et al senses the temperature distribution of the selected area, and uses that data to alter the temperature distribution of the selected area by altering the output from the radiation source (ass discussed in the above Office Action).

58. A skilled artisan would understand that the calculation involved in controlling the temperature distribution of the selected area would involve balancing the energy

outputs/inputs, knowing the thermal conductivity, and knowing how much alteration is need to the radiation source output to correct any needed temperature distributions in the part. Since the temperature distribution of the selected area is affected by the energy input/output from the surrounding area and the radiation source, and thermal conductivity of the area.

59. The Examiner would like to point out that the language used in claims 1 and 6 does not preclude the use of a feed back loop system (which is essentially what Andersson et al uses) to create a calculation based on temperature distribution sensor data. It is noted that the features upon which applicant relies (i.e., the use of a non-feed back system: something akin to a quasi feed-forward system) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

60. Furthermore based on the language used in claim 1 nothing is done with the energy balance calculation, thus it could be argued that any skilled artisan could create an energy balance equation since no end use limitation is shown in claim 1. The same can be said of the thermal conductivity equation.

***Conclusion***

61. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY KENNEDY whose telephone number is (571) 270-7068. The examiner can normally be reached on Monday to Friday 9:00am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Del Sole can be reached on (571) 272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

tjk

/Joseph S. Del Sole/
Supervisory Patent Examiner, Art Unit 1791